

HOT DIP GALVANIZING

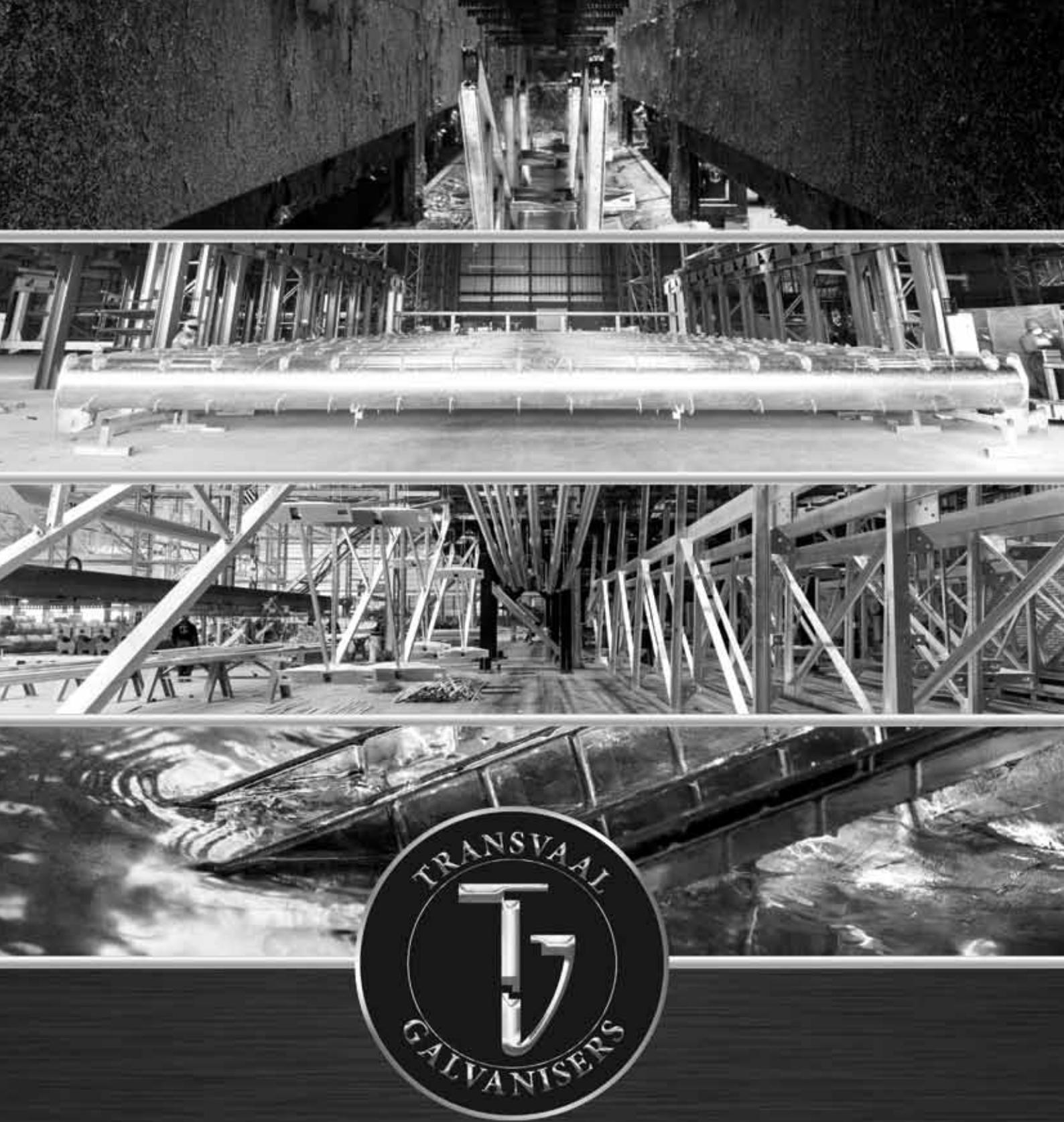
TODAY 73

The Official Publication of the Hot Dip Galvanizers Association Southern Africa



CORROSION CONTROL OF STEEL



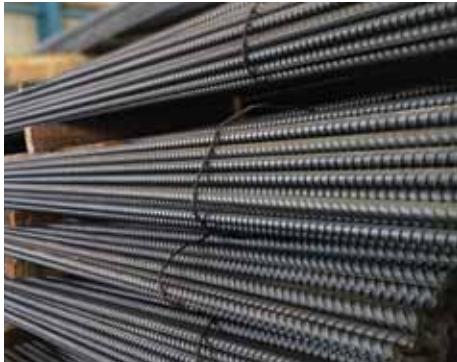


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14

Contents

THE ASSOCIATION IS AN INFORMATION CENTRE ESTABLISHED FOR THE BENEFIT OF SPECIFIERS, CONSULTANTS, END USERS AND ITS MEMBERS.

20 Advertisers' Index

REGULARS

- 2 Executive Director's Comment
- 4 Editorial Comment – in this issue...
- 20 Education and Training

FOCUS ON

- 5 New standards for rebar
- 6 Nickel use in hot dip galvanizing kettles
- 10 New legislation on liquid waste
- 12 Half of this instrument is already in your pocket!
- 14 New Thermal Spray Association of Southern Africa (TSASA)

NEWS

- 18 HDGASA Golf Day

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EXECUTIVE DIRECTOR'S Comment

The Association runs its financial year from 1 July to end June of any given year. 2019 proceeds apace and a quick analysis of the 6 month period prior to Christmas and the first quarter of 2019 suggests a tiny uptick in sentiment. Whilst most welcome, the activity increase, measured in tons of zinc consumed in the batch type galvanizing process, is small and an environment which stimulates confidence and investment in large construction projects must be created.

Outside of private developments, see the warehouses along the R21 between Pretoria and O.R. Tambo, as well as the showpiece hotel being developed in Sandton and automotive capacity investments, opportunities also exist in energy production and infrastructure maintenance and development.

The problems at Eskom are reported on widely and repetition is not required. Stimulating capital investment by independent power producers seems a good solution, at least in part, to this problem. Here a multitude of challenges need to be addressed. The price of energy, ability to pay the energy producers and the transition mindset from present suppliers of fossil fuels are all factors to be considered. Fair pricing, cracking down on non-payment by consumers are all decisive actions that are required to reverse a worrying situation. Smaller, fleet of foot and professionally run businesses, producing "greener" energy from solar or wind farms should be given every opportunity to exist as viable alternatives to capital intensive alternatives.

Beyond the small volume increase in zinc consumption mentioned earlier, another encouraging trend has been an increase in expenditure on industry related training. Over the past months galvanizers have engaged heavily with the Association on internal training. This pleasing trend has reaffirmed the belief that our members are intent, despite trying economic circumstances, to invest in the future. As encouraging is that several customers and related industry players have been sponsored for training. Alignment of key players such as engineers, architects and other specifiers in their understanding of the technology is vital. Topics related to types of corrosion, how zinc provides corrosion control, standards required for designers and fabricators to aspire to for effective hot dip galvanizing and finally the galvanizing process and finished product standards are discussed and shared.

Another recently observed trend is the intensified interest and involvement of suppliers to the South African hot dip galvanizers industry. In particular, internationally based companies have joined or rejoined the Association and have invested time and money in developing a profile with our members. Such interactions place the galvanizers in a strong position of familiarity with up to date trends in the galvanizing process and equipment used in the delivery of these processes.

Lets dare to be optimistic in terms of what 2019/2020 delivers and what positive spin-offs may result from the containment actions taken over this past year.

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EDITORIAL COMMENT in this issue

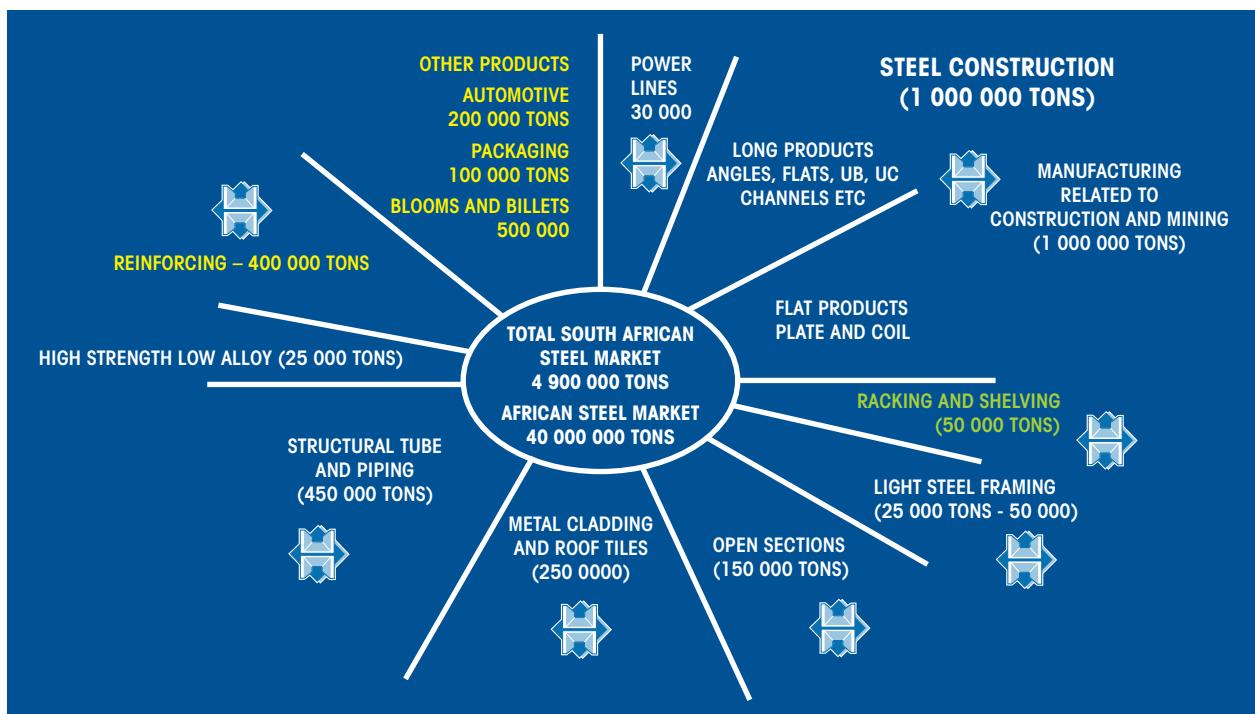
We face a new day with promises and challenges. It is said "if the plan doesn't work – change the plan NOT the goal". It is imperative that we continue to strive for the goals we have set in order be part of the force driving us into the future.

In this issue:

- Galvanized rebar is a growth market being adopted readily throughout Europe and into markets across all developed countries.
- Instrumentation in your pocket – how the market is now being offered a cell phone aligned option to measurement of hot dip coatings and duplex coatings.
- HDGASA Golf Day was again held at Wonderboom in Pretoria and the winter's day was more like a super spring day. SEIFSA, SABS and many other key players in the industry attended this successful networking opportunity.
- The facts and features of Nickel in the Galvanizing Kettle.
- Be aware of changes to legislation regarding waste liquors, changes will have an impact on the disposal of the liquids going forward.
- The Thermal Spray Association of Southern Africa is welcomed in releasing its statements through our publication.
- Education and training saw a upturn with several courses being attended from Operators training to Level I and Level II Inspectors courses.

Let our goal be to succeed and success be sustenance.

The HDGASA would like to apologise for a typing error which appeared in the info graphic on page 10 of Issue 72. Thanks to Rob Pietersma of the SAISC and SAFMA for pointing out the error.





NEW STANDARDS for rebar

THE HOT DIP GALVANIZERS ASSOCIATION OF SOUTHERN AFRICA HAS FOR A CONSIDERABLE PERIOD BEEN PROMOTING THE USE OF HOT DIP GALVANIZED STEEL REINFORCEMENT IN CONCRETE.

Steel reinforcement in concrete provides tensile and sheer strength to concrete to supplement its inherent strength of compression.

The point of departure for a good concrete structure is that the basics are strictly adhered to, here the following factors must be controlled:

- Correct depth of cover
- Correct mix
- Correct compaction
- Correct curing time

With these basics in place attention may be given to the reinforcement.

There are broadly speaking two ways in which the rebar may be adversely affected.

When concrete is cast it has a very high pH. Uncoated steel rebar will passivate itself against attack. With time, due to carbon dioxide dissolving in moisture – carbonation – there is a reduction in the pH and as the pH falls the passivation will

cease and the susceptibility to corrosion is heightened.

The presence of chlorides, either naturally in the concrete or introduced through the external environment, will cause a reaction with the steel and the onset of corrosion.

The benefits of hot dip galvanized rebar are simply that galvanized steel is less susceptible to carbonation as the pH falls and also that galvanized steel is more tolerant to chloride with a higher threshold level of possibly three times that of uncoated steel.

It is of significance that a new standard has been implemented: EN 10348-2:2018 – "Steel for the reinforcement of concrete – galvanized reinforcing steel and steel products". The HDGASA sees this development as very important in the drive to enhance the performance and service life of concrete structures, not only in Europe, but hopefully soon followed across our local markets and on the African continent.



Image credit: <https://images.squarespace-cdn.com>

NICKEL USE in hot dip galvanizing kettles

by Duncan Thompson

The use of nickel in the hot dip galvanizing process has proven to be the most practical and effective method of dealing with the problems associated with the hot dip galvanizing of silicon-containing steels. These steels, which are commonly referred to as "reactive" steel, exhibit a higher rate of alloy growth during the normal galvanizing process, leading to excessive coating thickness, poor coating adhesion and an unattractive grey surface appearance of the galvanized product.

The beneficial effect of the use of nickel to counteract the high reactivity of silicon containing steels was first discovered in the early 1960's in Canada, and started to find commercial application in Europe in the 1980's under the trade name "Technigalva". Since then the use of nickel in the hot dip galvanizing process has seen widespread use globally.

Why is silicon in steel a problem

Silicon released from the steel during galvanizing is insoluble in the intermetallic



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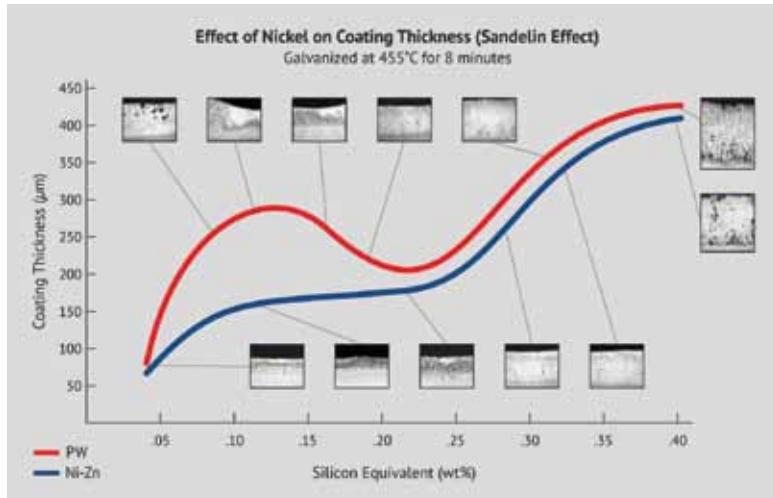
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layer known as the zeta layer. This creates instability in the zeta layer and produces thick, porous intermetallic layers. The microstructure is characterized by a very thin and uneven delta layer overlaid by a very thick and porous zeta layer. The porous intermetallic layer allows liquid zinc to react near the steel interface during the entire immersion period. This allows linear coating growth with immersion time, that results in the formation of excessively thick coatings. These coatings are generally very rough, thick, brittle and dull in appearance.

The presence of Si at certain levels,

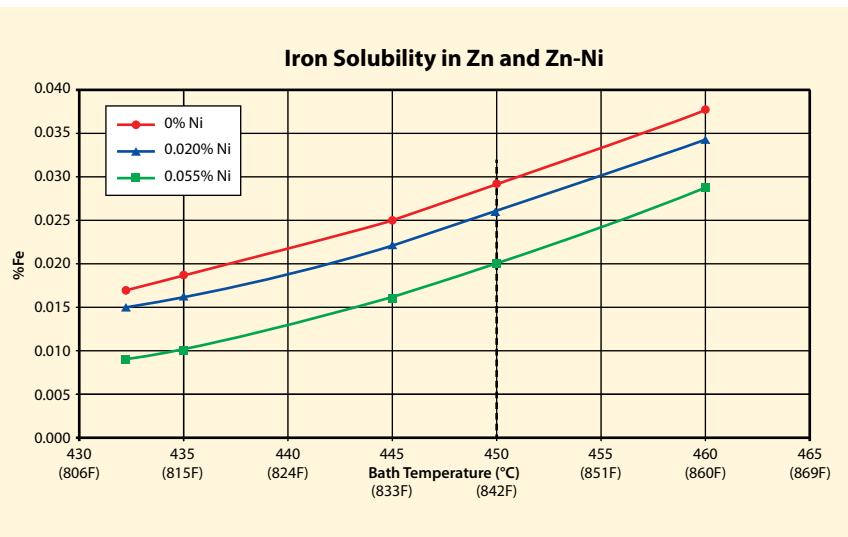
i.e. 0.03 – 0.14% (Sandelin area) and above 0.3%, produces a coating with excessive thickness, grey appearance, and poor adherence. Steels containing 0.15 – 0.25% Si produce a compact and coherent coating similar to that of low silicon steel. This is illustrated by the red line in Figure 1.

The introduction of nickel into the kettle suppresses this effect, which results in much lower coating thicknesses in the Sandelin part of the curve.

Nickel addition

There are several ways in which nickel can be added to the zinc kettle. These include:

1. Master Alloy – A master alloy containing 2% nickel in a zinc matrix can be added to the kettle. The dissolution of the nickel from the matrix tends to be very slow, and there is a tendency for the nickel to settle out of suspension to the dross before the NiZn alloy is in solution. This results in a nickel efficiency of around 20 – 30%.
2. Ni-Zn Pre-alloy – Nickel can be added as a 0.2 – 0.5% nickel, Ni-Zn pre-alloy. This gives a better distribution of the nickel into the kettle resulting in fewer losses when compared to the master alloy method. Efficiencies of around 33% for the nickel have been reported using this method.
3. Direct Alloying Process – Commercially this is known as the Cominco process whereby nickel is added directly to the kettle as a powder. Efficiencies for this method have been reported as high as 95% by Cominco. The disadvantage of this method is that specialized mixing equipment is required to introduce the nickel powder into the kettle.
4. Nickel Tablets – This is a method of introducing powdered nickel into the kettle without the need for specialized equipment. First patented in 2005,



this method employs a nickel powder mixed with fluxes, encapsulated in a flammable matrix to form a solid tablet which can be added to the kettle. The nickel addition efficiency for this method is varied, depending on the nickel powder and binders used, with claims as high as 98% being reported.

Nickel and dross

Dross may be formed after an elemental addition of nickel into the bath. This is due to the fact that the presence of nickel in the galvanizing bath decreases the solubility of iron in the kettle. The chart on the left, (produced by Teck Metals Ltd.), shows that as the concentration of nickel is increased in the galvanizing kettle, the solubility of iron decreases at a fixed temperature.

This shows that at a temperature of 450°C, a molten zinc bath can hold approximately 0.03% of iron in solution. If these conditions were held constant with no other outside factors, there would be no new dross formation as all iron would remain in solution. If there is then an elemental or alloy addition of nickel to the kettle and the nickel concentration is raised to 0.055%, the solubility and the total amount of iron in the molten zinc bath is capable of dissolving will be decreased to about 0.02%. The zinc bath will now be completely saturated with iron. Since there is no decrease in the total amount of iron in the bath the only option for the excess iron is to particulate and fall out of solution. When this happens, the iron particles will react with the zinc and form dross. Typically, dross formation occurring after a nickel addition tends to settle near the bottom of the kettle in the form of bottom dross.

It is therefore essential to keep the iron content of the kettle as low as possible when using nickel to mitigate against this reduction in iron solubility.

Summary

- The addition of nickel into a hot dip galvanizing kettle can significantly reduce the zinc usage, particularly when "reactive" steel (Silicon content of 0.05 – 0.15%) is used. This results in large overall cost savings for the galvanizer.
- Nickel can be added in several ways, however, the use of nickel tablets gives the best results in terms of ease of use and nickel efficiency.
- The use of nickel can increase bottom dross if the concentration is too high coupled with too much dissolved iron.



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NEW LEGISLATION on liquid waste

by Ian Tunnicliffe

Since 2013 and the promulgation of the National Norms And Standards For The Disposal Of Waste To Landfill (GN R 636 of 23 August 2013), together with the Waste Classification And Management Regulations (GN R 634 of 23 August 2013)('WCMR'), has seen a list of waste streams that are either restricted or banned from landfill, systematically over the last several years as per prescribed time frames, included in GN R 636. Thus far this has included inter alia, recyclable oils and oil filters, batteries, waste with calorific value of greater than 25MJ/Kg, tyres and fluorescent tubes.

This August will see the introduction of further restrictions on waste to landfill such as the disposal of liquid waste:

- (i) Waste which has an angle of repose of less than 5 degrees, or becomes free-flowing at or below 60°C or when it is transported, or is not generally capable of being picked up by a spade or shovel; or



Image credit: <https://www.greenbuildingafrica.co.za/south-africa-bans-liquid-waste-from-landfills/>

WASTE DEFINITIONS

Liquid Waste	Hazardous Waste with CV > 20MJ/kg
"Expired / redundant liquid products or raw materials (general or hazardous)"	Hydrocarbon / oil contaminated liquids and sludges
"Process effluents and liquid wastes not otherwise lawfully discharged to the Municipal sewer"	"Hydrocarbon / oil contaminated rags, PPE and other general wastes"
Oil-water separator sludges and effluents	
Paper and pulp sector sludges / effluent wastes materials	"Expired / redundant hazardous products and raw with CV > 20MJ/kg (liquid, sludges and solids)"
ETP filter-cakes / sludges with > 40% remaining moisture	Petro-chemical industry waste(s)
Acidic / caustic process sludges & liquids	Hazardous lubricating and mineral oils
other 'wash water' wastes	Paint sludges / solvent-based wastes

- (ii) Waste with a moisture content of >40% or that liberates moisture under pressure in landfill conditions, and which has not been stabilised by treatment.

These prohibitions could have major financial impacts on generators of waste, such as spent pickle liquor (SPL) from the galvanizing industry. Given that the costs for the treatment, recycling or recovery of these wastes are typically higher than waste to landfill, this challenge will be increased by generators outside of Gauteng, who do not have access to local SPL recycling facilities.

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Recently, DeFelsko Corporation launched their PosiTector Smarlink. The SmartLink, along with DeFelsko's free mobile app, wirelessly connect PosiTector probes to your smart phone/device.

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- Rename batches and add notes using the keyboard or microphone
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- AutoSync mode instantly backs up every reading to the cloud – no account required!

DeFelsko has also launched their own software, PosiSoft Desktop. PosiSoft is also free for download from the DeFelsko website. This powerful yet simple software makes it easy for the user to import readings directly from the gauge-smart phone/smart device via USB.

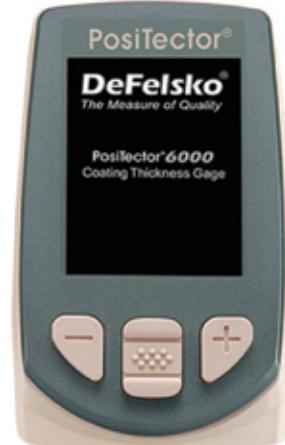
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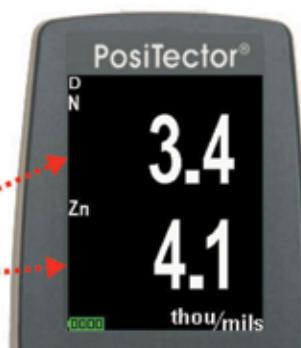
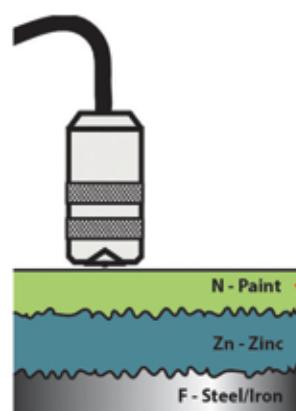
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NEW THERMAL SPRAY ASSOCIATION of Southern Africa (TSASA)



Image credit: <https://thermalsprayzinc.org/about-thermal-spray/>



After attending the annual International Thermal Spray Conference and Exposition in Houston in 2012, which was organised by the American Society for Metals (ASM) Thermal Spray Society, Jan Lourens from Thermaspray and Adam Wintle from Weartech both realised that South African industry could benefit greatly from an enhanced local thermal spray association. "A strong association would promote the benefits and developments in the technology, provide quality control services to regulate the industry and improve the reputation and quality of thermal spray products and services," says Lourens.

Following the conference, Lourens and Wintle approached the South African Institute of Welding (SAIW) to lead an initiative to create a new Thermal Spray Association of Southern Africa (TSASA). The timing was opportune, as the SAIW had already developed plans to offer services for the evaluation and quality control of thermal spray coatings as one of the roles of the new materials testing laboratory.

The Thermal Spray Society of ASM is a professional industrial association dedicated to expanding the use of

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thermal spray technologies for the benefit of industry. The international association has been closely tied to major advances in thermal spray technology, equipment and materials, industry events, education, standards and market development.

The use of thermal spray coatings is diverse – from the printing to the chemical processing industry, with applications that include: wear and corrosion resistant coatings; hard chromium plating alternatives; dielectric and electrically conductive coatings; thermal barrier coatings; food processing equipment coatings; medical instrument device coatings; EMI/RFI shielding; traction control and non-stick coatings.

"The applications are widespread and extremely exciting and will have an increasingly positive impact on industry as the technology is adopted more widely across sub-Saharan Africa".

Currently in South Africa, the industry lacks new applications and adequate investment, both in terms of capital equipment and modern technologies. The SAIW will offer its services to the TSASA in general, including evaluation services to ensure that thermal spraying is of good quality, and proactive marketing of the technology. "Poor quality products do exist in the market, but the majority of the products are working to required standards," says Sean Blake, general manager operations at SAIW. "One of the directives of the TSASA is to improve the image of the industry and ensure quality standards."

The TSASA will be a subcommittee within the SAIW. Further affiliation with global organisations such as the Thermal Spray Society (TSS), International Thermal Spray Association (ITSA) and *Gemeinschaft Thermische Spritzen e.V* (GTS) will be sought simultaneously.

The TSASA's vision is to restore the faith in the technology of thermal spraying in South Africa to the status it experiences and acclaims in the rest of the world. This will entail the standardisation of

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Image credit: <https://thermalsprayzinc.zinc.org/about-thermal-spray/>



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the technology and eventually unite the Southern African market. The mission of the TSASA is to develop in the South African market the technology in thermal spraying, through the implementation of quality standards applicable to thermal spraying as well as qualifying thermal spray coatings to these standards.

A conference planned for early next year that will also serve as a springboard to promote the objectives of the TSASA in developing the technology in the local market and ensuring all service providers adhere to the highest standards possible for the positive re-enforcement of these technologies. The TSASA aims to persuade large organisations that thermal spray coatings and other appropriate advanced surface coatings are the best solution in many applications and should be used in order to extend component lifecycles.

TSASA objectives include:

- Developing an organisation that will ensure that the Southern African thermal spray offering and usage is on par with that of the rest of the world.
- Ensuring that the members of the organisation receive tangible benefits.
- Engaging with research and development organisations in South Africa.
- Promoting and providing education and training to all stakeholders in thermal spray processes, materials and applications, as well as the adoption of existing international standards.
- Ensuring continuous education of all stakeholders through local conferences, workshops and exhibitions.
- A focus on safety improvements for both operators and the environment.
- Developing a certification programme and enforcing standardisation of approvals/standards (for those who need and use them for local and/or international markets).
- Develop integrated advisory programme applications within every industry sector, aiming at the following to begin with; mining, power generation, petrochemical, oil and gas, paper and pulp, printing, metal processing, aircraft and infrastructure (anti-corrosion)

"By enforcing thermal spray standards, the thermal spray industry in South Africa

will align itself with the international thermal spray industries and can start to be competitive not only in local markets but also be a role player in international markets," says Lourens.

The stakeholders that will be approached to join the TSASA include: thermal spray contractors and OEM's; thermal spray supply companies; welding and other engineering supply companies; surface engineering jobbing companies; gas suppliers; extraction suppliers; and robotic and automation specialists.

Blake suggests that a balance needs to be created as soon as possible in terms of representation on the management committee. "The committee needs to

be constituted from both academia and industry as well as users and suppliers of all thermal spray services and products," Blake concludes.

Membership in the association can be acquired by any business in the industrial and trade sector which, by way of thermal spraying, applies coatings to finished or semi-finished parts or products. Any association, legal entity or natural person who operates in the thermal spray industry and subscribes to the objectives of the association shall be eligible for membership.

The Thermal Spray Association of Southern Africa can be contacted on info@tsasa.co.za.

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HDGASA

Annual Golf Day



WONDERFUL WONDERBOOM WAS THE PLACE TO BE FOR THE HDGASA 2019 GOLF DAY



Twenty four balls were hosted and some special guests were invited to network on the course with our esteemed members.

Thanks to all the sponsors:

- Transvaal Galvanizing – Pink Lady and watering holes 1st and 9th
- Lianru for the half-way meal and refreshment
- CorriSA for their watering hole at the 17th
- Krome – 10th

The days results were:

1st Place

- Don Voysey (Bay Galvanizers)
- Wayne Bird
- Jacques Rover
- Dale Olridge

Runners up and Pink Lady

- R Opperman
- P vd Merwe
- J Pretorius
- S Lubbe

Third place

- D Ackermann (Armco Superlite)
- J Gillard
- D Struwig
- M van Niekerk

Longest day

- R Watchorn (Metsep)
- M Wese
- J vd Merwe
- J Gycio

Longest Drives

- Hole 3 – J Gillard
- Hole 13 – D Ackermann (Armco Superlite)

Beat the Pro

- Dale Kent (Transvaal Galvanizers)





THE ASSOCIATION WOULD LIKE TO THANK ALL THE ATTENDEES AND SPONSORS AND LOOK FORWARD TO MANY MORE SUCH EVENTS.



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EDUCATION and training

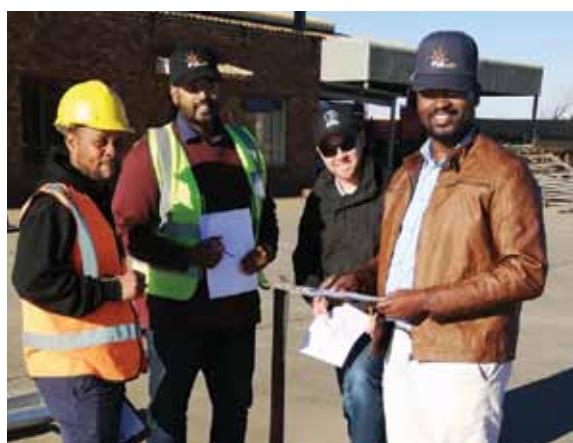


As we head towards the second half of the year, training is leading the charge. Training at our Galvanizing Members facilities and in Bedfordview saw record bookings in the third quarter. The need to be on point regarding hot dip galvanizing and the technology and standards is being embraced.

Training in the July was superbly supported by our Galvanizing Members and produced excellent results. The delegates who attended were lively contributors who actively participated throughout the courses run.

The course was attended by delegates from as far afield as Kathu in the Northern Cape and Vanderbijlpark. With keen enthusiasm at the Level II training events the teams put their best foot forward producing sterling syndicated reports.

Once again the HDGASA would like to welcome all who have succeeded in meeting the Level II course requirements and who now are proud affiliate members of the association.



THE ASSOCIATION WOULD LIKE TO ACKNOWLEDGE THE ADVERTISERS AND THANK THEM FOR THEIR SUPPORT

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“Knowledge is the only instrument of production that is not subject to diminishing returns”

John Maurice Clark

Level I: Introduction to Hot Dip Galvanizing

The HDGASA one day INTRODUCTION TO HOT DIP GALVANIZING course is designed to provide an initial understanding of the concepts relating to hot dip galvanized coatings applied for corrosion control of steel components. The course comprises six modules. In order for the course to be viable we require six or more candidates to attend. Arrangements can also be made for this course to be held at a venue of your choosing for more than six candidates. In addition to the course, a special visit to a hot dip galvanizing plant may be arranged on a separate date, should six or more candidates be interested and able to attend.

Level II: Certified Galvanizing Inspectors

The HDGASA advanced Level II course provides the necessary skills to assess the quality and conformance of Hot Dip Galvanized coatings and Duplex Systems to the applicable specification. Delegates are introduced to other metallic type coating specifications and their application for corrosion control design.

The course provides an in-depth interpretation of the specifications and accepted best practice procedures for determining coating thickness, visual inspection of surface finishes as well as the evaluation of these coatings for corrosion control of steel components. The course includes a visit to a hot dip galvanizing plant where delegates will have an opportunity to assess finished product against the relevant quality standards on a real time first hand basis.

Three Continuous Professional Development (CPD) points are awarded to delegates attending the entire course. Bookings are limited to a maximum of 10 people, with applications treated on a first-come-first-serve basis. In order for the course to be viable we require 6 or more candidates to attend. Arrangements can also be made for the course to be held at a venue of your choice for more than 6 candidates.

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(length x width x depth)

RANDFONTEIN:



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(length x width x depth)

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Armco Galvanizers Isando has been operating since 1989. Geared up to accommodate heavy structural steel up and till 13m in length. Isando has an average output of plus minus 2000 tons per month. With an improved lay down area and increased loading capacity by addition of a tower crane we strive to give "A" class service to all our customers big or small.

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